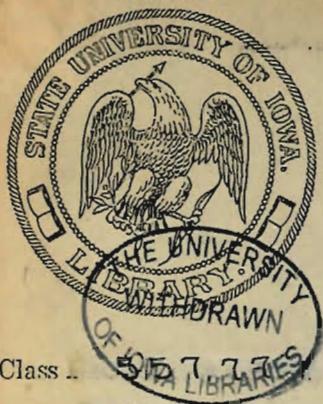


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Annual report
VOLUME XXII

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OF
IOWA GEOLOGY AND MINING
BY
CHARLES KEYES

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GEORGE F. KAY, STATE GEOLOGIST
JAMES H. LEES, ASSISTANT STATE GEOLOGIST



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LETTER OF TRANSMITTAL.

IOWA GEOLOGICAL SURVEY.

To Governor George W. Clarke and Members of the Geological Board:

Gentlemen:

I have the honor to submit for publication an Annotated Bibliography of Iowa Geology and Mining by Dr. Charles Keyes.

This bibliography will serve the very useful purpose of making available and accessible to all students of geology the extensive and widely scattered literature of the geology of Iowa, a state which is one of the most important, geologically, in the entire Mississippi basin. The volume systematizes for a limited but typical area, data which have much more than a local bearing and which have also important general aspects.

In addition to the dictionary catalogue of the literature there are included most interesting historical chapters dealing with the development of knowledge of the geography and geology of Iowa from the early years of the seventeenth century to the present.

In the preparation of the Annotated Bibliography of Iowa Geology and Mining, the Survey has been particularly fortunate in having the services of Dr. Charles Keyes, who, for twenty-five years, has been a student of the stratigraphy not only of the Mississippi basin but of many other parts of America and also of the Old World. During the organization period of the Iowa Geological Survey he was for several years in active charge of the stratigraphic investigations in the state.

I take pleasure in recommending that the Annotated Bibliography of Iowa Geology and Mining be published as Volume XXII of the Iowa Geological Survey.

Yours very sincerely,

GEORGE F. KAY,
State Geologist.

PREFACE

During the last two decades much has been written on the geological features and the mineral wealth both of our own state and of the other states of the Upper Mississippi Valley.

The literature relating to the geology of Iowa is an extensive one. So voluminous and widely scattered is it that it is a matter of exceeding difficulty for any Iowa student to refer readily to more than a small part of that which has been published on any given subject. Some sort of synopsis of what is printed on the various localities and topics appears particularly needful at this time. This bibliography of Iowa geology is intended to meet this want.

In the preparation of the dictionary catalogue of the articles, memoirs and works bearing directly upon our State's material make-up and mineral resources the aim has been to include only those publications which are, in their character, strictly geological or which relate to the mining aspects of the subject.

As to exactly what titles should be included and what not has not always been an easy task to decide. In consequence, the criteria employed in making the selections of the subjects which should be properly included do not always, at first glance, appear to be the same in every case. A controlling factor in all is the originality of the work reviewed. Many otherwise meritorious articles are omitted simply because they in no way contribute anything to our knowledge of the subject to which they relate. Thus a large number of titles, which ordinarily might be expected to be mentioned, are not found among the lists. Those pertaining wholly to methods of mining and to purely technological details are likewise omitted in this connection. They come properly elsewhere.

One of the most noticeable considerations connected with the bibliographical index is the fact that the literature is so widely

scattered, and now so largely inaccessible to the people of the State. The last of the two earlier geological reports was issued nearly half a century ago. The copies were rather sparingly distributed, and during the period which has elapsed since their publication most of them have been lost, destroyed, or passed beyond the boundaries of the State. In the meantime the population has largely increased, so that even if the reports were all at hand the supply would be very inadequate.

A goodly number of references have appeared in the publications of learned societies and have had a limited distribution, a large share of which has been foreign. Many of the papers referring to the geological phenomena as presented in Iowa are found in the reports of other states; still others are scattered far and wide through various journals and serials, both in English and foreign languages; besides, there are many short articles, and more or less lengthy allusions included in the long list of publications printed by the Federal Government. A large majority of these descriptions are unknown to the people of the State, who, consequently, know not where to look for the information desired.

In the consideration of the literature of a subject the bibliographic matter may be arranged into four principal categories: (a) that which is strictly geological in its character; (b) that which is only incidental to geologic work; (c) that which is largely secondary in its nature, that is, forming important announcements of discoveries, or partaking of the character of criticism, notices, or reviews of work already done; and (d) that which is largely compiled from original sources with no additions of results of new investigations. References belonging to these four classes have received very different treatment, according to the importance of their bearing upon the subject.

Those of the first class comprise almost the entire list of references made. The more important titles of the second category have been included. The third and fourth classes have been omitted altogether.

In glancing over the titles herein enumerated, the majority of people probably will be impressed at once with the large number of references, and with the apparently extensive literature

pertaining to the geology of Iowa. More careful perusal, however, will doubtless bring out the striking fact that many of the publications are purely scientific in character. The reason for this is not far to seek. For a long period of years scientific work in the state received little or no public aid or encouragement. Whatever work was carried on was done at private expense by scientific men who received no financial compensation for either the time or the money expended in prosecuting their researches. Thus, only the purely scientific results were placed before the world, while all the information of economic importance in the various lines of investigation was unable to be directed through those channels most likely to reach the people of the state. This information is, therefore, largely forgotten, or filed away in places now almost out of reach of the public. Nevertheless, the scientific work, done so generously by persons having no hope of financial reward or public aid, places the economic investigation of Iowa's natural resources upon a firmer basis than could possibly have been done otherwise without years of special labor.

The plan of the bibliography is essentially that of a dictionary catalogue, or bibliographical index. There are:

(1) An authors' list, in which is given the full title, volume, pages, and illustrations of the book or serial in which each article appeared, and place and date of publication. This is followed by a very brief synopsis of the contents of each article.

(2) A title index, in which the name of each article appears under each of its leading words. Then comes the name of the author and an abbreviated reference to its place of appearance.

(3) Subject entries and cross-references. These embrace under each topic, all references to any particular subject, as to each county, geological formation, zoological group, special subject, etc.; also those writings referring to the state in general. The names of authors, and abbreviated references to place and time of publication are given in all cases. Whenever additional information is wanted, reference can be made directly to the name of the author.

One of the principal advantages in the present scheme is that in no case is it necessary to turn back from title to title in order

to obtain a full bibliographic reference. A worker upon any systematic group of animals, a particular geological formation, or a given area, finds all the articles upon the subject brought together.

The cross-references are arranged under the following principal headings, the classified list of the subjects being given below:

1. *General.*

Addresses; History; Biography; Bibliography; Education; Classification; Correlation; Mapping; Nomenclature; Surveys; Administrative Reports, etc.

2. *Regional.*

State in general; sections of the state; counties of the state.

3. *Economics.*

Ore-deposits; Origin; Lead; Zinc; Iron; Gold; Aluminum; Silver; Minerals.

Fuels; Coal; Lignite; Peat; Rock-oil; Natural gas.

Building materials; Granites; Quartzites; Limestones; Sandstones; Kaolins; Fire-clays; Shales; Brick-clays; Ballast-clays; Sands and Gravels; Cement rocks; Road material; Gypsum.

Soils.

Abrasive materials.

Minor minerals.

4. *Structural.*

Deformation; Sedimentation; Erosion; Rock-weathering; Glaciation; Eolation.

5. *Physiographic.*

Topography; Valleys; Rivers; Lakes; Plains; Altitudes; Climate; Rainfall.

6. *Stratigraphic.*

Geologic History; Geologic maps; Terranes; Geologic Formations.

7. *Paleontologic.*

Geographic Distribution; Geologic Distribution; Correlation; all larger zoologic groups; all larger botanic groups.

8. *Mineralogic.*

Minerals described.

9. *Underground Waters.*

Mine-waters; Artesian waters; Springs; Mineral waters; Phreatic waters; Well Waters.

10. *Petrologic.*

Rocks described; Rock-forming Minerals; Rocks, origin.

There are certain aspects in the history of the state that are not plainly brought out in a mere dictionary catalogue of the literature. A short chapter on the early geographic exploration of the region is one of these. A similar chapter treats of the character of the several geologic reconnaissances in the state.

The historical sketch of our mining in the state has a national bearing and presents many instructive phases. Its interest is not confined to the geological field alone. In the enumeration of results of geologic mining sundry advantages of systematically investigating the mineral resources of the state are pointed out. The comprehensive character of the work thus far conducted is indicated by the list of reports which have appeared in the first score of published volumes by the present Geological Survey.

Two general geologic sections of Iowa rocks are given. The first has been recognized in all recent publications of the Iowa Geological Survey. The second was constructed by the author of this volume and was recently published in Volume XIX of the Proceedings of the Iowa Academy of Science. The position and equivalence of all terranes or formations which are mentioned in the literature may be readily referred to the one or other of these sections.